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Automobile Corporate Networks in Europe: Sectoral specialization of Central and Eastern European Cities

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Abstract

The global automobile industry is made up of very large corporations and their various subsidiaries containing different functions that create a complex system of locational structures. The networks formed by the 19 largest automobile transnational corporations constitute an automobile "oligopoly" representing more than 90% (OICA, 2012) of the world's production. Since the mid-1990s, Central and Eastern European cities have become attractive for transnational corporations and particularly in the initial stage for the production functions in the automobile sector. This leads to a crucial question. Do Central and Eastern European cities become also attractive for strategic functions (such as R&D) or are they still manufacturing-oriented in the automobile industry? This paper focuses on the patterns and the main factors influencing the role of central and Eastern European cities that have become integrated in the global value chain of the automobile industry. By analysing the various locations of the specialized functions within the corporations, this study extends the research on global value chains (Gereffi and Korzeniewicz; 1994, Sturgeon, 2000; Krätke, 2014). The spatial patterns of functions and the ownership networks of the automobile industry are constructed in order to identify the cities supporting it. In particular, the way that national metropolises bring their national territories into the globalization of the automobile industry is addressed.

Key words: City Networks, Global Value Chains, Global Production Networks, Transnational Corporations, Network Analysis, Automobile Industry

Introduction

Central European countries entered contemporary globalization later than Western countries because many were part of the communist system inside the Soviet Council for Mutual Economic Assistance (COMECON). Western corporations began investing in the region in the mid-1990s, accelerating the Eastern European transition to a market economy. These initial investments were mainly located in the capital cities, although it often subsequently led to a secondary on their national territories. A wide range of studies have been conducted on the link between automobile manufacturing and regional development in Central and Eastern European countries because of the expansion of the capitalist economy after the fall of communism (Grabher, Stark, 1997; Domanski, 2003; Pavlinek and al., 2009; Lung, 2004). These studies have evaluated the potential of change during the post-socialist transition to a market economy and the main actors in this transition, which are mainly composed of multinational corporations and their organization in global value chains (Gereffi and Korzeniewicz; 1994, Sturgeon, 2000).

Combined with the improvement of institutions with a skilled labor force and low wages, foreign direct investment created the conditions for the attraction of further investments linked directly or not to the automobile industry (Domanski, 2003; Domanski, Lung, 2009). According to Domanski (2003), it contributed to enhancing competitiveness and narrowing the gap between Central and Western Europe. Domanski assumed that the attraction of Eastern Europe, which was initially based on the wage-cost advantage and market access, would rapidly change with the attraction to more skilled functions, such as R&D, finance, management and marketing.

The Domanski assumption leads more than 10 years after, to question how the Central European cities became more attractive for high skill functions. Also, are they integrated into the world system only as a complement to the Western European cities or do they create an independent process of integration? In this paper, we will empirically test the hypothesis that Domanski claimed 10 years ago. After recalling the general concepts we used (2) we will build the urban networks database (3) in order to explore the different functions of Central European cities, their weight in the world and the European automobile industry's global value chain (4).

The global economy networks in urban systems

In order to build the empirical study, we used the concept of networks, which was developed through both approaches of global value chain, and global production network (2.1). It can help identify the role of specialized cities in the global automobile network (2.2). But the delineation of the automobile sector and its functional components is crucial in order to reveal cities' specializations (2.3).

Global value chains (GVC) and global production networks (GPN)

The complexity of the global economy can be revealed through the concept of network, which reflects the structural and relational movement of the organization of goods and services (Coe et al., 2008). It has been investigated through two main approaches: the "global value chain" (Gereffi, Humphrey, Sturgeon, 2005) and the "global production network" (Coe et al., 2008; Dicken, 2011). The global value chain considers globalized production as a series of cross-border financial transactions related to flows of goods and services between different enterprises within the automobile industry, while the global production network focuses more on the production process itself. Thus, the global value chain is mainly focused on the governance of inter-firm transactions, while the global production network focuses more on the concrete steps and the physical movement of products through different companies and places. Although they have different emphases, both concepts share a common conception of economic space as a discontinuous territory of cities linked by their relations in a global network. In addition, both conceptions offer a multi-sectoral perspective in at least one industry on the economic geography of the globalization of cities (Coe and al, 2008; Sturgeon, 2000; Krätke, 2014).

The automobile industry as a multi-sectoral industry

Krätke (2014) compared the global urban system of the automobile industry with that of advanced services (Sassen, 2012), such as finance, but restricted his study of automobile sector networks to their production or

manufacturing functions. However the automobile sector does not only comprise manufacturing plants; it encompasses a wide range of economic activities or sectors that are fundamental to the functioning of the industry. This means that a comprehensive survey of the locational structure of the industry needs to deal with as many of the different functions or sectors as possible.

Nine functions of the global value chain in the auto industry were initially defined based on precedents from the economic literature (by Dicken, (2011): sales, finance (including insurance), manufacturing, management, R&D, leasing, logistics, public relations and marketing. Identifying these nine different functions highlights how they develop specialized complementary tasks in the automobile industry's global value chain. Some subsidiaries could operate two or more functions but we take into account the predominant one.

The role of cities in a multi-sector approach

The geography of the whole of the automobile industry, like the locations of other corporations, depends on the advantages and amenities of various urban places. For example, locational factors such as the size and quality of markets, accessibility for goods and service inputs, availability of capital, or inducements such as the extent of government subsidiaries can determine the attractiveness of a city for a corporation to locate its plant or subsidiaries there. In addition three different agglomeration economies of cost savings may be present. For example is the site chosen able to expand production to derive economies of scale, because of savings per unit of production due to increased size that may be a result of the expanded possibilities or local markets?

However, cities have to contain essential assets in order for industries to develop efficiently. First, firms in the automobile sector specifically develop economies of localization such as through the share of skilled or specialized workforce and, as is well known, the presence of services or sub-contractors' networks (or the future opportunity of these developing) (Pavlinek and al., 2009; Bathelt and Glückler, 2011).

The urban territories selected also need to possess good infrastructures of transport and telecommunication as well as institutions (research centres, universities, trade chambers), associations (professional federations, economic development agencies) or service companies (consulting, lawyers), features that create other types of cost savings or *economies of urbanization* (Camagni, 1996). Since these economies vary between cities global corporations make different decisions to locate their various sectors and subsidiaries in various places. However these features vary through time and sometimes the forces of inertia mean that plants or offices remain in a location, either because it would be too costly to move, or that the organization has not realized or is indifferent to some move to a more advantageous location.

The analysis of the global value chain of the automobile industry using the five main sectors provided two main results. First was the identification of the structure of the network at an aggregate world level. Second was the extent to which the different functional sectors of the industry are differentially located, which revealed a global and regional specialization of cities in this industry.

Role of Eastern European cities in the large automobile industries' networks

This study analyses the various locations of plants and services associated with the largest 19 automobile corporations that have a world presence (OICA, 2013) in order to determine the global spatial structures of their networks. The 19 major corporations produce more than 76 billion out of 84 billion units, which represents 90.3% of the world vehicle production, (OICA, 2012) (Table 1).

Group	Origin	Headquarters	Units produced in thousands (2012)	World production percentage
Toyota	Japan	Toyota city	10,104	12.0%
G.M	United States	Detroit	9,285	11.0%
Volkswagen	Germany	Wolfsburg	9,255	11.0%
Renault-Nissan	France/Japan	Paris	8,119	9.6%
Hyundai	South Korea	Seoul	7,126	8.4%
Ford	United States	Dearborn	5,595	6.6%
Fiat-Chrysler	Italy	Torino	4,499	5.3%
Honda	Japan	Tokyo	4,111	4.9%
PSA	France	Paris	2,912	3.4%
Suzuki	Japan	Shizuoka	2,894	3.4%
Daimler	Germany	Stuttgart	2,195	2.6%
BMW	Germany	Munich	2,065	2.4%
SAIC	China	Shanghai	1,783	2.1%
Tata	India	Mumbai	1,241	1.5%
Mazda	Japan	Hiroshima	1,189	1.4%
Mitsubishi	Japan	Tokyo	1,140	1.3%
Dongfeng	China	Wuhan	1,138	1.3%
Fuji	Japan	Tokyo	753	0.9%
FAW	China	Changchun	706	0.8%
Total 19'			**76,110**	**90.3%**
Total world			**84,236**	**100.0%**

Table 1 - The major automobile companies: world production ranking (2012). Charles Bohan © IGD, 2013. Data Source: OICA, 2012

Defining the functions of the enterprises in the Automobile industry

The whole range of corporate functions, from initiation of the product to its sales, provides a comprehensive description of the relations in the industry but needs the information about logistic movements between firms. On a large set of enterprises, it is not possible to have all this information and thus the global value chain will be geographically identified and interrelated through a series of ownership relations in which individual cities play very different functional roles in the industry (Sturgeon, 2000; Krätke, 2014).

Functions were identified combining information on Orbis data (BvD, 2013) and company's reports. The information was allocated to its closest fit among the nine sectors or functions proposed by Dicken (2001) that are ranked by their importance in terms of number of enterprises:

- Sales: consist of all subsidiaries whose principal activities wholesale, retail, trade, repair and car maintenance and represent 39.6% of the total subsidiaries of the 19 major companies.
- Finance: regroups financial and insurance activities, (19.5% of all subsidiaries).
- Manufacturing: includes the production of spare parts and the assembly plants (23.4%).
- Management: represents the management and administrative activities (6.4%).
- Leasing: this function constitutes all forms of car renting and solutions to acquire a car. This function is distinguished of finance because it's a feature activity of the automobile industry (3%).
- R&D: High and low level activities of research and development and design, including formation centres (2.8%).
- Logistics: transportation activities and software solutions (2.7%).
- Public relations: services designed to improve the conditions of workers and the image groups in public policy (1.2%).
- Marketing: advertising and market study activities (1.1%).

Sometimes, some enterprises develop several functions and we chose the main ones according to the companies' reports. For example, in Poznan, the "Volkswagen Poznan" plant is mostly manufacturing-oriented although it is also a sales plant. However, since an analysis of the nine functions would be too detailed to explore in one paper, only the five most significant functions are investigated:

- Sales, finance and manufacturing, which are predominant in weight;
- Management and R&D functions, which are important in terms of strategy and organization.

We also distinguished the main corporate groups' headquarters to the other headquarters. The main headquarters of the European constructors and the regional European headquarters of the non-European groups as General Motors (US) or Toyota (JP) are unique for each group (Figure 1).

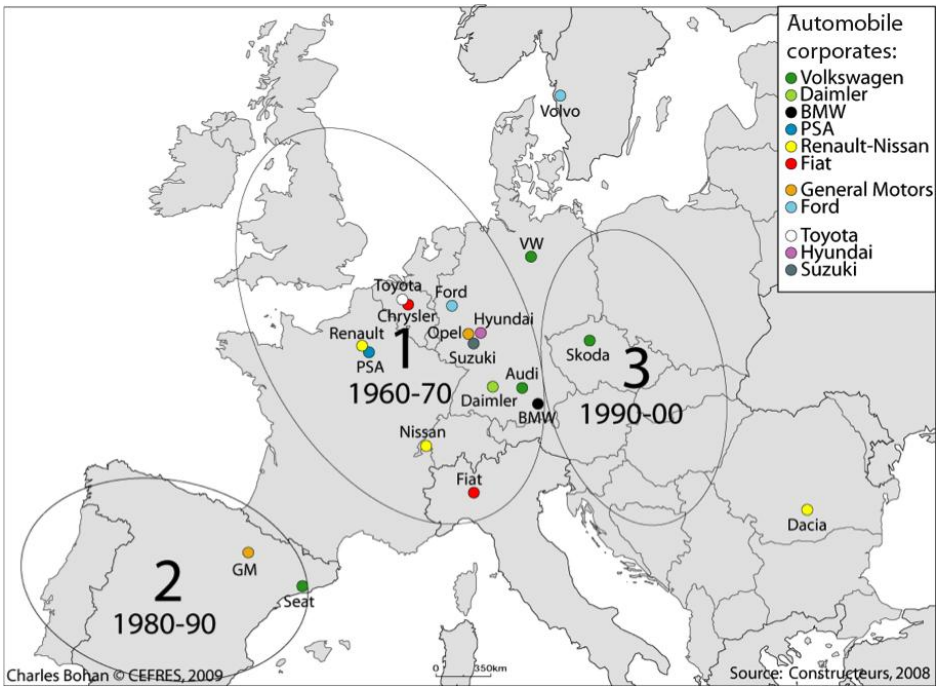


Fig. 1 – Location of automobile headquarters and regional headquarters in Europe

Delineation of networks

The firm networks of all 19 major automobile corporations at the micro level of their subsidiaries were identified. Since the automobile industry is a diverse sector that includes very different sectors, only the subsidiaries related to the automobile sector for each specific firm were selected. For instance, the Fiat group is connected to the media sector and Daimler to the aeronautic and defense sector (EADS), but subsidiaries of this type were excluded. This decision ensured that only the core functions, those directly associated with, of the automobile industry were investigated.

All corporations have a chain of ownership from their headquarters to their various subordinate levels of firms (Alderson and Beckfield, 2004; and Wall and van der Knaap, 2011). This forms a quasi-tree and the ORBIS database (BvD, 2013) indicates all the ownership linkages of each firms. It does not affect its functions. For instance, the management entities are not necessarily headquarters or regional headquarters that are at the top in terms of power. A subsidiary with small administrative functions can be at the bottom of the regional or specialized hierarchy. At the opposite, a main headquarter entity can have a financial attribution if finance activities predominate on management activities. So, every entity can generate outgoing or incoming links, whatever its function.

The 19 corporate groups spread networks of (quasi) trees of subsidiaries, with the maximum of 9 levels of subsidiarity. In total, these micro-networks represent 11,000 subsidiaries including 4,465 in sales, 2,639 in manufacturing, 2,205 in finance, 715 in management and 323 in R&D. The number of employees of each company, or its turnover, could not be used because of missing information. So all the plants, offices, societies, etc. represent the same weight in the analysis. Although this could cause difficulties if the objective is to deal with the importance of the subsidiaries to local economies, it is of less concern if we aim to assess the attractiveness by city.

Aggregation of enterprises by cities' areas

Another step consisted of building 'urban' networks according to the locations of the 19 micro-networks. The aggregation process shifted from the networks of the 19 main firms that contained 11,000 subsidiaries (micro level) to their location in almost world 700 large urban areas (cities). Since the functional areas of cities are not limited to their strict administrative boundaries but rather extend to their surroundings, the subsidiaries were allocated to their functional urban areas (Rozenblat, Pumain, 2007). In many countries, the level of regular commuter flows have been used to delineate these functional urban areas (FUA), such as in Europe (Halbert et al, 2012) and the USA, Canada, according to national delineations in China and India and other BRICS countries (see Swerts, 2013). The equivalent was built

manually for other countries of the world where standard FUAs are not available.

The sum of the outgoing links from each city is called the Outdegree or power. That means number of subsidiaries controlled by each city in the other cities. For instance, if a company from Poznan possesses 3 subsidiaries in Warsaw and 2 in Krakow, Poznan will get an Outdegree of 5. This method helps to characterize the control ability, hierarchical power and dominance over financial control of the corporations within each metropolis.

The incoming links (or Indegree), which is the opposite, identifies the various subsidiaries that have been located in other cities, presumably on the attractiveness of that centre for that business. This provides a measure of the 'attractiveness' of the city to the external subsidiaries, which can be seen as representing the use of local production abilities, access to specific knowledge or resources, innovation abilities, etc.

Cities' positions in the European automobile network

In section the first section, we will illustrate how the European automobile network gives different weights to the cities according to outgoing or incoming links of subsidiarity, which respectively underline the power and attractiveness of cities. In the following section, the focus is on the five main functions of the automobile industry highlighting the specialization of Central European cities.

European patterns of the automobile network

Figure 2 shows the total number of incoming and outgoing linkages for the main automobile companies in comparison with those in Western Europe. The power of the cities (Outdegree) reveals that the Central and Eastern European cities do not yet have significant control or importance in corporate networks for there are few power or outgoing links. However, they have many incoming links, showing they constitute strong attractiveness for the locations of subsidiaries. Prague, Warsaw and Budapest have comparable linkages with Western European cities, such as Madrid, Frankfurt or Milano,

in the automobile industry. This is a consequence of combining lower production costs and a skilled workforce. Eastern European cities also represent a young dynamic market and a bridge between Western and Eastern European markets.

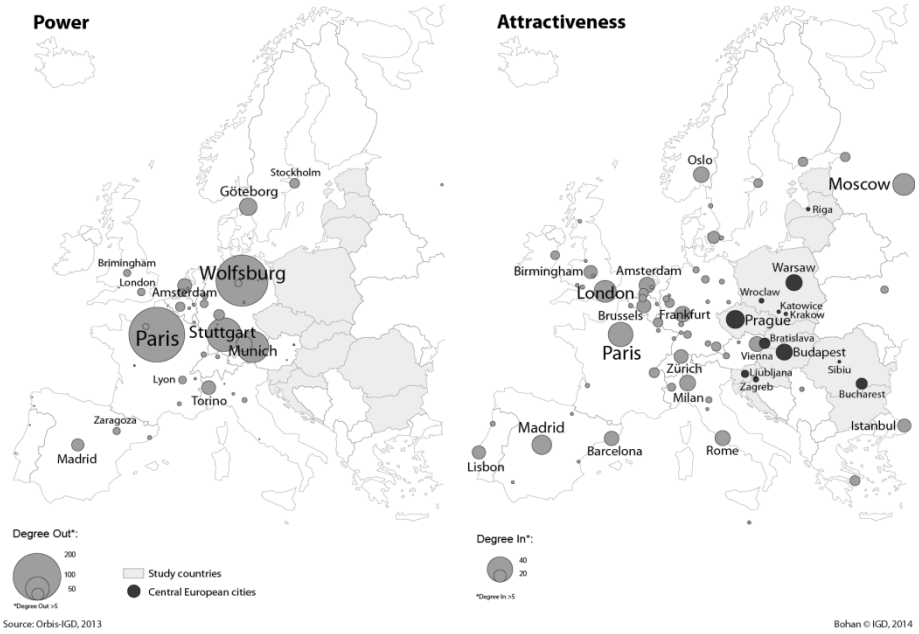


Fig. 2 – Power and attractiveness of European cities in the automobile industry

The automobile industry networks are quite closed at this continental level: 80% of foreign direct investment comes from other countries of Europe. Japan, United States and Korea share the rest of the foreign investments (CNUCED, 2012). China is not yet very present in Europe compared to current leaders. The Asian and American companies mainly cooperate with Western corporations in joint ventures or limited alliances. For instance, Shanghai-based SAIC cooperates with General Motors, FAW with Volkswagen and Dongfeng with PSA. They can expect to grow on the Chinese market, but based on current trends their growth may not affect Central European locations since these are still under the control of Western companies. For example, Volkswagen, the European automobile leader, already owns the Czech firm Skoda, which would make difficult for Skoda

to chart an independent growth strategy, since control is exercised by the German company. A different diffusion scheme would only occur if the older automobile firms like Skoda or Dacia had grown separately, and not been incorporated into the Western European automobile firms. However in these circumstances, these historical Central European firms would probably not have survived without the purchase and investment by Western firms in the very competitive world auto market. The process of development so far seems similar to the integration of the Iberian car industry after the European Union enlargement in 1986. In this case, the most strategic functions of Seat were absorbed by Volkswagen, and moved to the Western core (Lung, 2004).

Automobile functions of Central European cities

The European subsidiaries of the automobile industry have divided in nine functions and five of the most important functions of the automobile industry are shown to enable an easier comparison of support (sales, finance), productive (manufacturing) and strategic (management, R&D) functions.

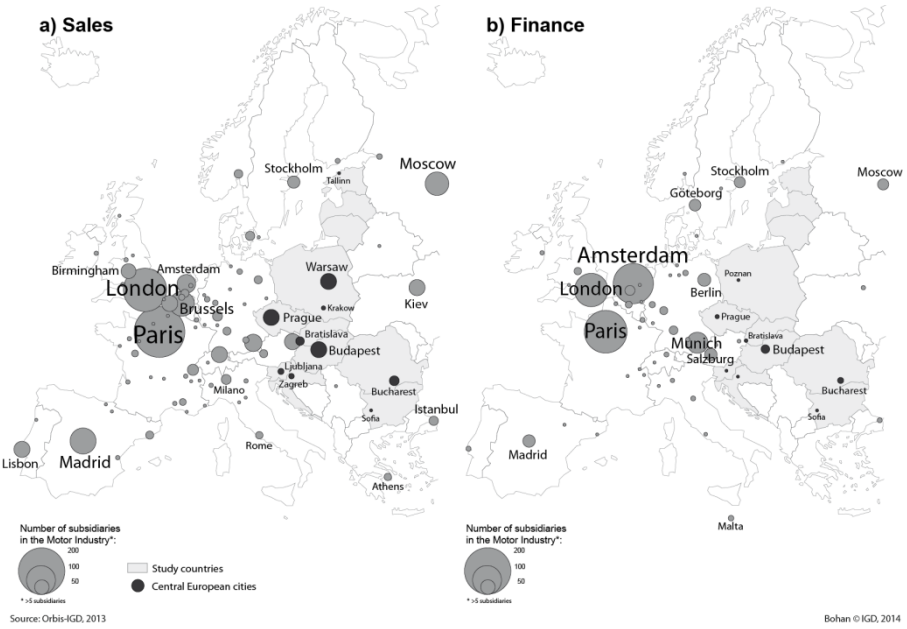
The sales function, in Figure 3 (a), shows that a large number of subsidiaries are located in three of the main Central European capitals, Warsaw, Prague and Budapest, and to a lesser extent in Bratislava and Bucharest. Therefore, the sales subsidiaries are quite concentrated in capital cities and are much less diffused in Eastern European cities than in Western cities.

By contrast, the locations of the finance subsidiaries in Figure 3 (b) reveal a much more concentrated pattern in the main Western European centres, with only very minor locations of such subsidiaries in places such as Budapest and Prague, showing not only the way control is still exercised in the West but in the underdeveloped nature of the capital markets in the East.

The patterns of the manufacturing subsidiaries have a more dispersed form, with concentrations in many of the Eastern European centres, and Istanbul (Figure 3 (c)). Indeed, Prague and its surrounding region almost compete with Paris in terms of the number of subsidiaries. In the Western part of Europe, historical centres of the automobile industry, such as

Birmingham/Coventry, Stuttgart, Torino and Sochaux (in France) still provide important capacities, but Polish, Hungarian or Czech cities now represent equivalent sizes. Although it must be stressed, these maps are based on the number of subsidiaries, not their size, as not enough comparable data is available for this calculation to be made.

The locations of the management and R&D functions (Figure 3 (d)), confirm that all of the most strategic functions stay in the Western part of Europe and have not shown any significant relocation to the East. Stuttgart still possesses most of the European management and R&D functions, along with Paris, Munich and Wolfsburg. This underlines the remaining peripheral position of the Central European cities in the European organization of the global value chain of the automobile sector.



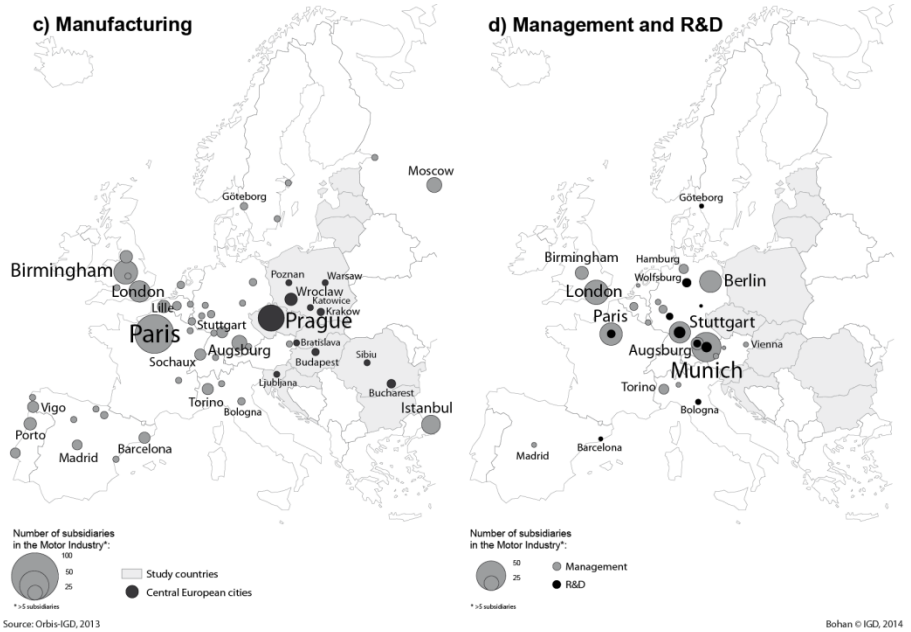


Fig. 3 – Sales (a), finance (b), manufacturing (c), management and R&D (d) subsidiaries of the automobile industry in Europe

Conclusion

The empirical results of the analysis of the position of Central and Eastern European cities in the networks of the automobile subsidiaries reveal their strong attractiveness for some of the sectors of the industry but not for all the functions of the global value chain. Power (where headquarters are located) is still mostly concentrated in the major Western European cities, which are the historic centres of the automobile industry. Central European cities remain in a peripheral position compared to Western cities because of the re-organization of the local companies incorporated into Western powerful automobile corporations. These can be considered as an extension of the Western automobile industry more than an independent and emerging region because of their lack of strategic functions. Although Europe is becoming more integrated, the Central and Eastern European cities remain quite peripheral in the range of functions they contain in the automobile industry.

Thus, the paper demonstrated that the assumption of Domanski (2003), who forecasted the rapid rise of Central European cities as European technological leaders, has not yet come true. The attractiveness of Central European cities for functions with high added value has not yet been reached. So the industrial upgrading by businesses and institutions is still in progress after 10 years of adhesion to the European Union. Western companies still maintain leadership, which implies the dependence and specialization of Central European cities in low price manufacturing and intensive mass production. With this initial condition creating a strong path dependence, the catch up of Central and Eastern European cities compared to Western cities will be more difficult than expected and will take a long time.

The public action that could accelerate this process is a higher support of the EU (H2020 and other structural funds) in the technological and scientific integration of Central European cities. The goal would consist of reinforcing the local base of historical local firms (such as Skoda and Dacia) who all have been incorporated into Western companies. An innovation or institutional governance reinforcement would leverage all of the urban services and complex entrepreneurial organizations, giving more autonomy to the development of the Central European urban system.

References

Alderson A.S., Beckfield J. (2004), Power and position in the world city system, *American Journal of Sociology*, 109, 4, pp. 811-851.

Bathelt H. and Glückler J. (2011), *The Relational Economy*, Oxford University Press, 320 p.

Bohan Ch. (2009) « Les stratégies des firmes multinationales de l'automobile dans l'Europe élargie : Le modèle centre-périphérie à l'épreuve », *Géocarrefour, Vol 84-3*, p.181-191, Lyon

Camagni R. (1996), *Principes et modèles de l'économie urbaine*, Paris, éditions Economica, 382 p.

Coe N.M, Dicken P. and Hess M. (2008), Global production networks: realizing the potential *Journal of economic geography*, Vol. 8, pp. 271-295.

Dicken, P. (2011), *Global Shift: Mapping the Changing Contours of the World Economy*, The Guilford Press, *6th ed.*, 607 p.

Domanski B. (2003), Industrial Change and Foreign Direct Investment in Post socialist Economy, *European Urban and Regional Studies*, Vol.16, n°1, p. 5-10

Domanski B., Lung Y. (2009), The Changing face of the European Periphery in the Automotive Industry, *European Urban and Regional Studies*, Vol.10, n°2, p. 5-10

Gereffi G. and Korzeniewicz M. (1994), *Commodity Chains and Global Capitalism*, Westport, CT: *Greenwood Press.*

Gereffi G., Humphrey J., Sturgeon T. J. (2005), The Governance of Global Value Chains, *Review of International Political Economy*, Vol. 12, 1, 78-104.

Grabher G., Stark D. (1997), Organizing diversity: Evolutionary Theory, Network Analysis and Post-socialism, *Regional Studies*, 31:5, 533-544.

Krätke S. (2014), How manufacturing industries connect cities across the world: extending research on 'multiple organizations', *Global networks*, Vol.14, Issue 2, pp. 121-147.

Lung Y. (2004), The Changing Geography of the European Automobile System, *International Journal of Automotive Technology and Management* 4 (2/3), pp. 137-65

OICA (Organisation Internationale des Constructeurs d'Automobile) (2013), World Motor Vehicle Production by Country and Type, 2010-2013. Paris, OICA (www.oica.net)

Pavlinek P., Domanski B., Guzik R. (2009), Industrial Upgrading through Foreign Direct Investment in Central European Automotive Manufacturing, *European Urban and Regional Studies*, Vol.16, n°1, p. 43-63

Rozenblat C., Pumain D. (2007), Firm linkages, innovation and the evolution of urban systems in P.J. Taylor et al (ed.) Cities in Globalization, practices, policies and theories, *Routledge*, pp. 130-1560.

Rozenblat C., Bohan Ch., Benet G. (2008) "Multinational Corporate Networks in Central European Cities", in (dir. P. Gajdoš) *Regional Disparities in Central Europe*, Bratislava, Sociologiský ústav Slovenská Akadémia Vied, p. 195-212

Rozenblat C. (2010), Opening the black box of agglomeration economies for measuring cities' competitiveness through international firms networks, *Urban Studies*, Vol.47, no.13, pp. 2841-2865.

Sturgeon, T. J. (2000), How do we define value chains and production networks? MIT IPC Globalization Working Paper 00-010, Cambridge, MA: Massachusetts Institute of Technology.

Taylor, P. J. (2004) *World city network: a global urban analysis*, New York: Routledge.

Wall R.S., van der Knaap G.A. (2011), Sectoral Differentiation and Network Structure Within Contemporary Worldwide Corporate Networks, *Economic Geography*, Vol. 87, Issue 3, pp. 267-308.